

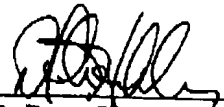
REMARKS

The Examiner is invited to contact the undersigned if there are any additional matters to which we must attend regarding this application. Prosecution on the merits hereof is respectfully requested.

Respectfully submitted,

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"Jig-saw puzzle"

Cross Reference to Related Applications

[00001] This application is a National Stage application and a continuation-in-part of International Application No. PCT/AU03/00284, filed on March 11, 2003, which claims priority of Australian Application No. PS 0994, filed on March 12, 2002.

Field of the Invention

[00002] This invention relates to a jig-saw puzzle.

Background of the Invention

[00003] Jig-saw puzzles are well known and have been in existence for many years. A typical traditional jig-saw puzzle comprises a piece of art work which is laminated onto a material, usually cardboard or wood, and which is then cut into a number of interlocking pieces. Depending on the number and the size of interlocking pieces and the pattern of the artwork, jig-saw puzzles can be created which range in difficulty from puzzles which would be suitable for an infant child, up to much more complicated and challenging puzzles for adults seeking a mental challenge.

[00004] There are various known ways of making jig-saw puzzles which are challenging and difficult to complete. One way is to make the pieces very small and almost identical in colour and shape. It is also common to make jigsaws having a thousand or more pieces since all else being equal, the more pieces there are to the puzzle, the longer it takes to complete. It is also known to make jigsaw pieces which are double sided which can increase the difficulty of the puzzle.

[00005] There are also ways of making jigsaw puzzles more interesting, particularly for children by for example including special pieces in the jig-saw puzzle which have particular shapes such as numbers, letters, silhouettes of animals, or the like.

[00006] One attempt to make a more interesting/challenging puzzle is shown in US 5842697 which discloses a jig-saw puzzle which when assembled, forms a sphere. One of the disadvantages of the puzzle shown in US 5842697, is that the design is limited to a spherical shape. That limits the application of the puzzle and also somewhat limits the artwork which can be applied to the puzzle. Of less significance, there is considerable wastage in the manufacture of the pieces for the puzzle and over half of the material has to be recycled.

4

Figure 6 illustrates the introduction of spacing between the pieces shown in Figure 5 so that they can be cut separately, and the slight enlargement of each piece;

Figure 7 shows a pattern of knife cuts which to be superposed over Figure 6 which cuts are used to form hinges on transition pieces and a trapdoor piece of the puzzle;

Figure 8 shows an assembled jigsaw in the shape of a cube;

Figures 9a to 9d illustrate pieces for use where a convex curved surface meets a flat plane;

Figures 10a and 10b illustrates an internal structural double piece defining a groove; and

Figure 11 illustrates an injection moulded plastic piece which including surface irregularities to increase interference between pieces.

Detailed Description of a Preferred Embodiments

[000019] Referring to the drawings, Figure 1 shows a schematic diagram of the reverse face of a transition piece 12 which forms part of a 3 dimensional puzzle embodying the present invention. The piece is made from a sheet of material such as plastic or paperboard or cardboard to which an image has been laminated to the opposite side to that shown. Any suitable plastics material may be used. The perimeter of the piece has been laser cut from a sheet of material as part of a process which will be described in more detail below. The perimeter of the piece defines a series of male elements 14 and female elements 16 of interlocking means or clasps which are used to couple or lock the pieces to other pieces of the puzzle. This means of interlocking is well known to anyone familiar with the art of jigsaws and will therefore not be described in great detail. However, it is important to note that whereas in the prior art typically the female coupling element will be larger than the male coupling element which interlocks into the female coupling element, in the present invention, the interlocking means are most preferably laser cut rather than cut with a knife and that the male and female elements are substantially the same size. The pieces may be cut using a knife, however, since the pieces are cut individually, using a knife is much more expensive in terms of initial set up capital costs.

[000020] As shown, the transition piece is divided into two planar elements 18, 20 by a hinge or fold line 22 formed by partially cutting through the reverse face of the material with a knife. Alternatively, the hinge line may be creased or impressed.

[000036] As well as laser cutting as described above, where plastics materials are used for the pieces, the pieces could be die cut out or stamped out. Alternatively the pieces may be made individually by injection moulding or the like, or may be moulded using some other process such as casting. Where injection moulding is used to manufacture plastic pieces, the resistance between pieces could be moulded into the pieces using a pattern, grooves or other surface irregularities, so as to achieve resistance between interlocking pieces. Such a piece is illustrated in Figure 11 in which features shared with the piece of Figure 2 share the same reference numerals and wherein ribbing 100 is present on one coupling element, grooves 110 are present on another coupling element, and a pattern of raised dots or protrusions 112 is present on another coupling element.

[000037] Puzzles made of plastic, wood, metal or other harder materials would have an advantage over cardboard pieces in that they would be more durable and could be used for larger structures due to the increased strength of the material compared to cardboard and paperboard.

[000038] It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

1. -- 18 (canceled)
19. (new) A jigsaw puzzle including a plurality of rigid planar pieces, a plurality of interlocking cooperative pairs of coupling elements being formed in said pieces to interlock edge to edge each adjacent piece to another adjacent piece characterised by at least some of the pieces being transition pieces which include hinges and define transitions between two intersecting surfaces in the completed puzzle.
20. (new) A jigsaw puzzle as claimed in claim 19 wherein each transition piece includes a single hinge line.
21. (new) A jigsaw puzzle as claimed in claim 19 wherein the planar pieces comprise paperboard or cardboard having a thickness in excess of 1mm.
22. (new) A jigsaw puzzle as claimed in claim 19 wherein the planar pieces comprise a solid plastics material.
23. (new) A jigsaw puzzle as claimed in claim 19 wherein the hinges are defined by score lines cut into one side of the transition piece only such that the piece may be bent in one direction only.
24. (new) A jigsaw puzzle as claimed in claim 22 wherein the coupling elements define grooves, patterns or other surface irregularities to provide resistance between interlocking coupling elements.
25. (new) A jigsaw puzzle as claimed in claim 19 which when assembled defines a hollow cube.
26. (new) A jig-saw puzzle which when completed, forms a 3-dimensional object defining at least two intersecting surfaces, the puzzle being formed from a plurality of such interlocking generally planar pieces, at least some of which are transition pieces being hinged such that one part of the piece is co-planar with one of the intersecting surfaces and an other part of the piece co-planar with a second different intersecting surface.
27. (new) A jig-saw puzzle as claimed in claim 26 wherein the transition pieces have a first face and a second face and define fold lines defined on one face of the pieces so that the piece may be bent in one direction only.
28. (new) A jig-saw puzzle as claimed in claim 26 wherein the angle defined between the two intersecting surfaces of the transition piece in the 3-dimennsional object is substantially less than 180°.
29. (new) A jig-saw puzzle as claimed in claim 26 further including a hinged structural piece defining first and second relatively rotatable planar portions, the first portion in

10/507285

use defining part of an external surface or shell of the puzzle, the other second portion extending inside the external shell of the puzzle.

30. (new) A jig-saw puzzle as claimed in claim 29 wherein the second portion of the structural piece defines a slot for inter-engagement with parts of the structural pieces.

31. (new) A jig-saw puzzle as claimed in claim 26 wherein the generally planar pieces are formed from a non-foamed plastics material.

32. (new) A method of making a jigsaw puzzle of a 3-dimensional object comprising the steps of:-

mapping the surfaces of the object to two dimensions;

defining a series of transition pieces crossing edges of the object where the surfaces of the object intersect and redistributing areas of the surfaces to take account of the transition pieces;

separating the pieces in the two dimensional map;

forming hinge lines in the transition pieces; and

cutting out the pieces.

33. (new) The method of claim 32 wherein the pieces are slightly enlarged prior to cutting.

34. (new) The method of claim 33 wherein the pieces are cut out using a laser cutter.

35. (new) The method of claim 33 wherein the pieces are cut out using a knife blade.

36. (new) A jigsaw puzzle including:

a plurality of rigid plastic planar pieces defining a first face and a second face joined by side edges, a plurality of interlocking cooperative pairs of coupling elements being formed in said side edges of said pieces to interlock edge to edge each adjacent piece to another adjacent piece to form a self supporting surface wherein the coupling elements define surface irregularities or patterns to increase interference between interlocking coupling pieces; wherein

the pieces when assembled form a hollow three dimensional object defining intersecting surfaces characterised by;

a plurality of transition pieces, each transition piece comprising two generally planar portions joined by a hinge line, each portion defining coupling elements for interlocking with corresponding coupling means on adjacent pieces; wherein

the hinge lines of the transition pieces defining intersecting surfaces of the hollow three dimensional object.

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